7. The subject of *Spherical Harmonics* (Laplace's coefficients) is also treated at some length, and in a somewhat novel way, which leads to one of the quaternion methods of attack though without actually employing that calculus itself.

8. Further, there is given, for the first time, the complete solution of the problem of *Induction of Currents* in a disc rotating in the magnetic field, taking account of the mutual action of the currents on one another—a condition which very materially increases the difficulty of the problem. The result is a very curious one; and it appears especially curious when we compare the very simple, almost homely, methods employed by Maxwell with the elaborate analysis by means of which Jochmann and others, some years ago, attacked the incomplete and (comparatively) easy statement of the problem where the mutual action of the currents is not taken account of. This piece of work is worthy of being placed beside that of Thomson, referred to under (6) above, as among the very best things ever done in Mathematical Physics.

9. The ratio of the electro-magnetic to the electrostatic unit of electricity is a *Velocity* whose absolute value is independent of the magnitude of the fundamental units employed. This has been shown by Maxwell to be the velocity with which waves of transverse vibration will be propagated in the medium whose stresses &c. account on his theory for the apparent action at a distance. Neither the velocity of light in free space, nor the ratio of the electric units, is *certainly* known as yet within five or six per cent., but it is assuredly a most striking fact that (in millions of metres per second) three of the best determinations of the former of these quantities give

314, 308, 298,

while apparently equally good determinations of the latter give

311, 288, 282.

Such approximation is evidently much more than a mere fortuitous coincidence, it shows that a great step has been taken in the grand question of the connection between radiation and electrical phenomena.

Having said so much in hearty admiration of this noble work, a work which will do more to raise our country in the eyes of really competent judges than cartloads of more pretentious publications, it is only natural to seek some of its defects. There are spots on every sun; and they are, as phenomena, sometimes more instructive and therefore more worthy of observation than the sun itself. But, as they are not visible save to those whose eyes can bear the full glare of the glowing orb, and who therefore do not require our aid, it is unnecessary to point them out. Such a proceeding would be mere pandering to that miserable form of envy which leads inferior minds to gloat over the defects of their superiors.

The concluding section of the work is particularly well fitted to terminate our article.

"We have seen that the mathematical expressions for electrodynamic action led, in the mind of Gauss, to the conviction that a theory of the propagation of electric action in time would be found to be the very keystone of electrodynamics. Now we are unable to conceive of propagation in time, except either as the flight of a material substance through space, or as the propagation of a condition of motion or stress in a medium already existing in space. In the theory of Neumann, the mathematical conception called Potential, which we are unable to conceive as a material substance, is supposed to be projected from one particle to another, in a manner which is quite independent of a medium, and which, as Neumann has himself pointed out, is extremely different from that of the propagation of light. In the theories of Riemann and Betti it would appear that the action is supposed to be propagated in a manner somewhat more similar to that of light.

"But in all of these theories the question naturally occurs:—If something is transmitted from one particle to another at a distance, what is its condition after it has left the one particle and before it has reached the other? If this something is the potential energy of the two particles, as in Neumann's theory, how are we to conceive this energy as existing in a point of space, coinciding neither with the one particle nor with the other? In fact, whenever energy is transmitted from one body to another in time, there must be a medium or substance in which the energy exists after it leaves one body and before it reaches the other, for energy, as Torricelli* remarked, 'is a quintessence of so subtle a nature that it cannot be contained in any vessel except the inmost substance of material things.' Hence all these theories lead to the conception of a medium in which the propagation takes place, and if we admit this medium as an hypothesis, I think it ought to occupy a prominent place in our investigations, and that we ought to endeavour to construct a mental representation of all the details of action, and this has been my constant aim in this treatise."

OUR BOOK SHELF

Medizinische Jahrbücher Herausgegeben, Von der K. K. Gesellschaft der Aerzte redigert von S. Stricker. Jahrgang 1872. Hefte i. ii. iii. iv., pp. 513; mit xii. Tafeln.

THE second volume of Stricker's *Medizinische Jahrbücher*, now before us, maintains the promise of the first. It is made up of a number of separate essays on various subjects, physiological, pathological, and medical; the physiological essays predominating over the others.

Amongst these the following deserve notice.

1. Researches on the heart and blood-vessels, by Dr. Sigismund Mayer. In this paper Dr. Mayer shows that the extraordinary increase of pressure of the blood against the walls of the blood-vessels which occurs as a result of the administration of strychnia is due to intense excitation of the vaso-motor centre in the brain, which leads to contraction of the small arteries.

2. A paper by Ewald Hering on the influence of the respiration upon the circulation. In this he shows that moderate expansion of the lungs by insufflation causes diminished blood pressure in the arteries and increased rapidity of the heart's action. This latter effect, however, is not due to the increased pressure exerted upon the external surface of the heart, nor to alterations in the conditions of resistance in the circulation; nor to differences in the exchange of gases; nor to any dislocation of the heart's position, but is effected reflectorially through the pneumogastrics in such a manner that the activity of the cerebral centre of the inhibitory nerves is lowered.

3. MM. Oser and Schlesinger give the details, in an elaborate essay, of many experiments they have made to determine the causation of the movements of the uterus, and state that they have arrived at the conclusion that these movements can be induced by suspension of the respiration; by rapid loss of blood; or by arrest of the supply of arterial blood to the brain.

4. M. M. Rosenthal contributes an interesting essay on the death of the muscles of the body, and on apparent death. He made many experiments on about twenty sub-

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* *Lezioni Accademiche* (Firenze, 1715), p. 25.

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jects on the time after death, or rather after the last respiration to show that contraction of the muscles could still be induced by electricity, when applied to them either in the form of the interrupted or of the continuous current. The excitability of the muscles appears to be the same as before death, for a short time after death has taken place; then contractility departing rather sooner in chronic disease than in cases where death has been occasioned by an accident or other sudden event. In most cases contractions may be excited for from 1½ hour to 3 hours after death. The reaction to induced currents falls in a centrifugal direction; the sphincter palpebrarum retaining its irritability longest. From these experiments he was led to think that the absence of irritability in the muscles might be taken as a good means of distinguishing between real and apparent death, and accidentally very shortly afterwards a case of apparent death in an hysterical patient permitted him to satisfy himself as well as others of its value.

5. C. Heitzmann gives the results of his researches on healthy and inflamed bone, and agrees with Rokitansky, that blood is formed in the mother shells that under certain conditions appear in bone.

Other physiological papers are, one by Prof. Bizzozero, of Pavia, on the so-called endogenous formation of cells. Another by Dr. Kolisko, on the mechanics of the heart, and another by Schiff on the round ligament. The papers dealing with therapeutics, are (1) an essay by Dr. Basch on the action of nicotin, especially bearing on the question of the relation of the blood pressure to the periods of rest and contraction of the muscular tissue of the intestines; (2) a number of minor communications from Schroff containing the results of investigations made in the Vienna Pharmacological Institution. The pathological papers of most importance are (1) the remarkable essay of Lostorfer which has led to so much discussion in Germany, in which he declared that he was able to diagnose a certain specific disease (syphilis), by a microscopic examination of the blood; (2) an account by Dr. Philipp Knoll of a case of the rare disease termed paralysis pseudo-hypertrophica; (3) an essay by Dr. J. Popoff on pneumomycosis; (4) investigations on the organisation of thrombus by Dr. Durante; (5) on the changes taking place in ligatured vessels by Dr. Dudokaloff; (6) the diagnosis of disease of the optic thalami. Besides these are several others. The plates are very fairly executed, and our readers will see that Prof. Stricker has done good service in publishing these papers and essays in a collected form.

H. P.

LETTERS TO THE EDITOR

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. No notice is taken of anonymous communications.*]

Reflected and Transmitted Light

[The following correspondence has been sent us by Prof. Tyndall]:—

Cliff House, Greenhithe, April 8

A CURIOUS thing in connection with colour having come under my notice, and never having before seen it remarked in any scientific journal, I take the liberty of bringing it before your notice; if it is new to you it will interest you, if not I must ask you to excuse me for troubling you. On looking through a piece of blue glass (of which I forward you a sample) at a plant or tree lit up by the sun, those leaves that are lit from behind, or rather by transmitted light, appear of a rich crimson, the other leaves, seen only by reflected light, merely take the colour given by the glass. In the case of a geranium plant, those leaves become almost the same colour as the flowers. As a scientific fact, if new, it is curious.

To Prof. Tyndall WALTER B. WOODBURY

THE observation you describe is interesting, and if you have taken care to exclude subjective colouring, is, I should think, to be explained in this way.

The light from your leaves contains a quantity of red: it appears as a yellowish green, I suppose, and contains little or no blue.

Your glass is of a kind which transmits the two ends of the spectrum while cutting out its centre. It is very hostile to the yellow, hence, on placing it before the eye, and receiving through it light which has already been deprived of its blue, the glass quenches the yellow, and red alone remains.

April 9 JOHN TYNDALL

I detained this note until the arrival of sunshine, which enables me to say that the explanation here given is correct. Employing a blue medium, which does not transmit red you get no effect of the kind you describe. The tender leaves of spring are best suited for the experiment: the hard green leaves of ivy, for example, do not produce the effect.

It is not necessary, nor indeed desirable, to have the leaves between the eye and the sun.

April 15

The Zoological Collections in the India House

PERMIT me to offer my testimony in general support of the view taken by P. L S., in the able article which appeared in your last number. Rather more than a year ago it was a matter of importance for me to examine the type of Horsfield's *Turdus varius*, contained in the Museum of the Old East India Company. I applied in the proper quarter for leave to examine the specimen, but received a polite answer informing me that it was inaccessible. The official statement therefore said to have been made in the House of Commons on March 14, 1871, by the Under-Secretary of State for India, as to the collections being still "available to men of science" is untrue, and I trust that some member of Parliament will not allow this subject to be lost sight of, but, by continually recurring to it, compel the Administration to open their valuable Museum to the public—its owners. To the two solutions of the difficulty suggested by P.L.S., allow me to add a third. If neither the authorities at South Kensington nor in Great Russell Street can properly exhibit the East India Museum, let it be transferred (of course under suitable guarantee), to some other National Institution.

Cambridge, April 22 ALFRED NEWTON

On the Affinities of Dinoceras and its Allies

IN the April number of the *American Journal of Science and Art* there is a paper by Prof. O. C. Marsh, entitled "Additional Observations on Dinocerata," in which we learn that Dinoceras has only four toes. The author still continues to consider the genera *Dinoceras* and *Tinoceras* a separate order intermediate between the Proboscidia and the Perissodactylata. The facts at my disposal are now sufficient for me to state with considerable certainty that *Dinoceras* and *Tinoceras* are members of the Ungulata Artiodactylata. The following are my reasons:—

1. The palate is complete between the posterior molars, as is seen clearly in a photograph of *Tinoceras grandis* (*Loxolophodon cornutus* Cope) in my possession.
2. There is no third trochanter to the femur (Marsh).
3. The astragalus has a well-marked cuboid facet (Marsh).
4. The posterior molar has a small but well developed third cusp, as proved conclusively by an inspection of my photograph.
5. The anterior premolar is wanting, six only being present.
6. The premaxillæ are edentulous.
7. There are four toes, an even number.

A. H. GARROD

11, Harley Street, April 22

Auroral Display

A SHORT but very brilliant display of aurora was visible here this evening, making its first appearance soon after sunset, and reaching its greatest intensity between nine and ten o'clock. Some notes of its phases which I was able to make in a perfectly clear sky will perhaps afford useful comparisons with descriptions furnished by observers of its appearance at other places.

The sun had set behind cirrus clouds, surrounded by a slight halo, and with a faint mock-sun on its northern side. As darkness approached, the hazy clouds in the north-west were surmounted by a faint light, and at half-past eight o'clock luminous streaks here and there across the otherwise clear sky, apparently

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